Salmon Habitat Limiting Factors in Washington State

By
Carol J. Smith, Ph.D.
Washington State Conservation Commission
Olympia, Washington

Acknowledgements

This statewide document is a summary of all individual Habitat Limiting Factors reports developed for 45 basins in Washington State from 1998 through 2003, and could not have been written without the efforts of the many people who developed these original documents. The primary authors of these reports include Donald Haring, John Kerwin, Carmen Andonaegui, Mike Kuttel Jr., Gary Wade, Ginna Correa, Mary Wilkosz, Brian Cowan, Kevin Lautz, and Carol Smith with leadership from Ed Manary and additional support from Randy McIntosh (NWIFC), Kurt Fresh (NOAA Fisheries), Jennifer Cutler (NWIFC), Devin Smith (SRSC), and Ron McFarlane (NWIFC). This statewide report closely follows the outline used in the basin reports including some of the same text in introductory sections that was developed by the above-mentioned individuals, and this project would not have been possible without their vast expertise. All of the individual reports are listed in the Literature Cited section even though some are not directly cited because data within each of these reports was used in the accompanying Excel habitat ratings spreadsheet, which formed the basis for further analyses.

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Cover pictures feature the upper Skagit River (top photo) and Ruby Beach (bottom photo).

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EXECUTIVE SUMMARY

From 1998 through 2003, salmon habitat limiting factors analysis (LFA) reports were developed for all basins in Washington State that produced salmon or steelhead in addition to one Watershed Resource Inventory Area (WRIA) that produced only bull trout as an anadromous species. This is a summary report of those 45 individual reports that provides an overview of the results on a state, regional, and WRIA scale. Habitat results are also related to land ownership and land use. The purposes of this report are to provide a broader perspective of salmon habitat conditions and provide information across the state by habitat category, which is useful for those who are more interested in a particular type of habitat parameter rather than a specific stream. It shows how different habitat conditions vary by category across the state, and how land use and land ownership may play a role in habitat conditions. This report provides the following products: 1) a spreadsheet that provides at a glance all habitat ratings for the streams in all LFA reports, 2) maps and discussion of WRIA-scale ratings developed from the most frequent habitat ratings by category, 3) A discussion of the extent of data gaps for salmon habitat throughout Washington State, 4) the relationship of WRIA-wide habitat ratings results to land use and land ownership, and 5) a summary of salmonid stocks and stock status by basin.

Fish Stocks and Status Conclusions

Salmonid production, stocks, and status vary greatly across Washington State. Out of 161 independent salmon-producing drainages, three (Chehalis, Quillayute, and Skagit) produce 14% of the total, 17% of the wild, and 19% of the native salmon and steelhead stocks in the state. Twelve out of 161 drainages produce 35% of the total, 45% of the wild, and 38% of the native salmon and steelhead stocks in the state. These twelve drainages are the Chehalis, Quillayute, Skagit, Snohomish, Cowlitz, Nooksack, Queets, Stillaguamish, Puyallup, Quinault, Lewis, and Dungeness basins, which combined produce much of the genetic diversity of salmon and steelhead populations in the state.

The percent of healthy stocks also differs widely (stocks of unknown status are not included in the percentage). The Snake River, upper Columbia, and lower Columbia regions have very low percentages of healthy wild salmon and steelhead stocks (0%, 0% and 11% respectively), while the mid-Columbia has 40%, Puget Sound 56%, and the coast has 78% healthy wild salmon and steelhead stocks. Results are similar for native and total stocks. It is noteworthy that even the area with the healthiest stocks (the Washington Coast) still has wild stocks that are not healthy.

General Salmon Habitat Conditions in Washington State

Habitat types and conditions also vary across the state. Washington ranks 20th in the nation in size and 15th in human population with ¾ of the state's human population located in the Puget lowlands. Coniferous forest covers 37%, agriculture accounts for 21%, and urban lands comprise 2.5% of the state (Cassidy et al. 1997). There is much that we don't know about habitat conditions, and where we have information, the majority suggests degraded habitat. Most (43%) of the WRIA-scale habitat ratings are data gaps followed by poor habitat conditions (38%). Only 13% of the ratings are good and 7% are fair.

Only one WRIA (Upper Skagit) had overall good habitat ratings in all categories that were not data gaps. Methow, Naches, and Nisqually had an overall fair-good rating with 11 additional basins rating fair overall. Nine basins rated poor-fair, but more (21) basins rated poor than any other rating.

Data gaps are especially prevalent for water quality (particularly for water quality parameters other than temperature), sedimentation other than road density, and low flow categories. Data on pool habitat are even less common, but poor ratings in this category are often the result of impacts in landscape processes such as sedimentation, LWD supply, flow and riparian conditions, and measuring conditions of processes rather than symptoms (pools) is of greater value because it identifies the source(s) of the problem.

Land Ownership and Freshwater Habitat Conditions

Habitat ratings in nine categories (access, floodplain, sedimentation, riparian, large woody debris (LWD), pool, water temperature, high flow and low flow) were related to land ownership, but most of the ratings were poor across all land ownership percentages and types with a low number of good or fair ratings. This coupled with a lack of parcel-specific information of habitat conditions and land use/land ownership resulted in an inability to produce correlations with p-values of .05 or less (statistically significant). However, some broad conclusions can be made.

Basins with higher percentages of federal land had generally better ratings for nearly all of the habitat categories including: access, floodplain, LWD, riparian, high flow, and sedimentation conditions. The remaining three categories (low flows, pools, and water temperature) were not associated with any specific extent of federal land ownership. Lower percentages of state-owned land had typically better ratings for access, floodplain, and LWD conditions. Habitat data in other categories were too scattered to suggest a relationship with various percentages of state-owned land. Lower percentages of private land ownership were generally associated with better ratings for floodplain, sedimentation, LWD, pool, and high flow conditions. Data in other categories were too scattered to suggest a relationship.

Land Use and Freshwater Habitat Conditions

Forestry dominated WRIAs had generally better ratings for riparian, water temperature, and pool conditions, and nearly all of the fair to good rated WRIAs for access, floodplain, and LWD were in forestry dominated WRIAs. WRIAs with significant urban land use and/or higher human population densities had overall poor ratings in all but one habitat category. These poor rated categories include: access, floodplain, LWD, riparian, sedimentation, low flow, high flow, and pool conditions. The one category without a poor rating was water temperature, and this was due to widely scattered results. WRIAs dominated by agricultural lands had generally poor access, floodplain, and LWD conditions, while riparian and pool condition results were scattered across all percentages of agricultural land. Lower percentages of agricultural land were associated with better water temperature conditions.

Conclusions

Habitat categories with the greatest percentage of poor ratings were floodplain, LWD, and riparian, while access (culverts), high flows (land cover), and water temperatures had the greatest percentage of good ratings. Data coverage was better for riparian conditions than any other category due to broad scale data from Lunetta et al. (1997). However, newer data are needed to continue to assess conditions in the future. Data collection programs exist for water quality data as well as for basic flow data in certain streams, but assessments are needed to monitor trends and relate flows to salmon use and production. At this time, there are no programs that are funded on a regular basis to monitor and assess access, floodplain, sedimentation, riparian, and instream habitat conditions.

When habitat conditions are related to land use, urbanized basins had generally worse habitat conditions in most categories. Basins dominated by forestry had the best habitat ratings compared to other land uses. WRIAs dominated by agriculture had ratings that were not as good as forestry-dominated basins, but generally not as bad as the overall ratings in more urbanized drainages.

It is important to recognize that these results are based upon the individual limiting factors reports, which are snapshots in time of habitat conditions. New data at the local level is constantly evolving and readers are encouraged to check with local salmon recovery planning organizations for the most up-to-date information. In addition, the summarization of data to a broad statewide level results in a necessary loss of variability and sense of data gaps or uncertainty within a basin. A review of information at the local level is important to retain that perspective.

HABITAT LIMITING FACTORS BACKGROUND AND INTRODUCTION

How to Use This Document

This report is made available in a portable document format (pdf). This allows anyone with a computer and free Adobe Acrobat Reader® software to read and print the document. Adobe Acrobat Reader is available at: http://www.adobe.com/products/acrobat/readstep.html. The Adobe software has several useful features to aid your use of this document. The zoom feature allows you to magnify details, which is particularly useful for maps. Blue underlined text appears throughout the document as hyperlinks that can take you directly to the referenced item. Also, the Acrobat software allows you to search for your topic of interest, and has bookmarks to quickly access a desired chapter.

Habitat Limiting Factors Background

The successful recovery of naturally spawning salmon populations depends upon directing actions simultaneously at harvest, hatcheries, habitat and hydro; the four H's. The 1998 state legislative session produced a number of bills aimed at salmon recovery. Engrossed Substitute House Bill 2496 (now 77RCW) was a key piece of the 1998 Legislature's salmon recovery effort with the focus directed at salmon habitat issues.

Engrossed Substitute House Bill (ESHB) 77RCW in part:

- Directed the Conservation Commission in consultation with local government and the tribes to invite private, federal, state, tribal and local government personnel with appropriate expertise to act as a technical advisory group.

- Directed the technical advisory group to identify limiting factors for salmonids to respond to section 8 sub 2 of this act.

- Defined limiting factors as "conditions that limit the ability of habitat to fully sustain populations of salmon."

- Defined salmon as all members of the family Salmonidae, which are capable of self-sustaining, natural production.

The overall goal of the Conservation Commission's limiting factors project was to identify habitat factors limiting production of salmon in the state. In waters shared by salmon, steelhead trout and bull trout were also included. One area (WRIA 62, Pend Oreille) was included as bull trout only waters.

It is important to note that the responsibilities given to the Conservation Commission in 77RCW do not constitute a full limiting factors analysis. The hatchery, hydro and harvest segments of limiting factors are being dealt with in other forums.

New Products in this Report

Several products are the result of this effort.

- Detailed Spreadsheet. In a separate file to this report, there is a large spreadsheet with ratings for all habitat categories by stream and stream reach (when available) that were in each of the Conservation Commission's Limiting Factors Analyses (LFA). This includes most salmon-producing streams in Washington State. It is provided as an Excel file instead of a PDF so that others can easily work with the data, and it puts all of the habitat ratings for salmon-producing streams in one place. The information in the spreadsheet is also the foundation for subsequent analyses in this report. In addition, it shows finer scale data to provide readers with a greater sense of variability and data gaps or uncertainty within a basin, which can be overlooked when examining coarser scale data. Readers are encouraged to keep these factors in mind and refer back to the spreadsheet to see the original results by stream.

- Salmonid Stock Status. Information summarizing salmonid stock status is also included and this information is presented by WRIA and by salmon recovery region. Such information includes the number of wild, native, and total stocks as well as the status of those stocks.

- Summary of LFA Ratings by WRIA. The individual LFA ratings were combined to form a WRIA-wide rating for each habitat parameter. This provides a snapshot of the extent of habitat degradations and data gaps by category across Washington State. It also illustrates the geographic range and locations of conditions and data gaps. This summary data were based directly on the detailed spreadsheet discussed above.

- Maps of Habitat Ratings by WRIA. Numerous maps are provided to quickly illustrate the extent of habitat conditions across the state for each habitat category. Categories include access, floodplain, sediment quantity, sediment quality, road density, stability, riparian, LWD, pools, water temperature, dissolved oxygen, other water quality issues (nutrients, pH, toxins), high flow conditions, impervious surfaces, and low flow conditions.

- Habitat Ratings and Land Ownership/Land Use. Lastly, this report includes a summary of the habitat ratings by WRIA and discusses how those ratings relate to land ownership and land use.